EXHIBIT G

Opinions Regarding Lead Fate and Transport in the Matter of *California Sportfishing Protection Alliance v. Pacific Bell Telephone Co.*; Eastern District of California Case No. 2:21-cv-00073-JDP.

Prepared for:
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September 6, 2024

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ACRONYMS

ADE	Advection-Dispersion Equation
EPA	U.S. Environmental Protection Agency
Haley & Aldrich	Haley & Aldrich, Inc.
MDL	method detection limit
NOAA	National Oceanic and Atmospheric Administration
Pac Bell	Pacific Bell

1 Qualifications

I, Dr. Craig Jones, am a Principal Ocean and Environmental Engineer and am the managing principal of the Marine, Coastal, Climate, and Technology Services business area at Integral Consulting Inc. I have more than 20 years of experience in developing and executing engineering and science projects for government agencies and the private sector to characterize aquatic environmental sites. My experience includes riverine, lacustrine, estuarine, and coastal processes involving hydrodynamics, waves, sediment, and contaminant transport. My expertise includes the application of state-of-the-science field measurements and modeling analysis to characterize and quantify processes in all aquatic systems in support of site characterization and remedial activities. I actively participate in the design of field activities and instrumentation to develop data sets for the evaluation of aquatic systems using empirical and numerical modeling.

I received my bachelor of science degree in maritime systems engineering from Texas A&M University, Galveston, Texas, in 1994. I received my master of science degree in fluid mechanics (with minors in environmental ocean and environmental engineering) in 1996 and my Ph.D. degree in mechanical and environmental engineering in 2000 from the University of California, Santa Barbara. My professional affiliations include the American Society of Civil Engineers, the American Geophysical Union, the Marine Technology Society, the American Shore and Beach Preservation Association, and the International Electrotechnical Commission.

I have participated as a key technical lead at contaminated sediment sites worldwide, leading portions of the site characterization and remedial evaluation efforts including alpine lakes. My curriculum vitae, describing my technical experience in greater detail, is attached as Appendix A to this report.

1.1 AWARDS AND RECOGNITION

I am the recipient of the J.C. Stevens Award, recognizing excellence in a paper published by the American Society of Civil Engineers. The paper is in the field of hydrodynamics and sediment transport.

1.2 PUBLICATIONS

I have been a lead or coauthor on more than 20 peer-reviewed publications. A selected list of my publications is provided in my curriculum vitae (Appendix A).

1.3 PRIOR TESTIMONY

The following is a list of my testimony as an expert at a trial or by deposition:

- *Natural Resources Defense Counsel and Maine People's Alliance v. HoltraChem Manufacturing Company, L.L.C.*, Case No. 00-69-BW, U.S. District Court of Maine, August 2019 Deposition
- *Monsanto Company v. Spirer et al.*, Case No. 12SL-CC01263, Circuit Court of the City of St. Louis, State of Missouri, August 2016 Deposition
- *Monsanto Company v. Steele et al.*, Case No. BC 497582, Superior Court of the State of California for the County of Los Angeles, April 2016 Deposition
- *Monsanto Company v. Walker, et al.*, Case No. 1122-CC09621-01, Circuit Court of the City of St. Louis, State of Missouri, May 2016 Trial Testimony, April 2016 Deposition
- *Appleton Papers Inc. and NCR Corp. v. United States*, Case No. 10-c-910, U.S. District Court, Eastern District of Wisconsin, November 2013 Testimony, October 2013 Deposition

1.4 COMPENSATION

Integral Consulting Inc. is being compensated at the rate of $330 per hour for my work in connection with this matter. My compensation is not dependent upon rendering particular opinions.

1.5 SCOPE OF REVIEW

Paul Hastings LLP has requested that I, Dr. Craig Jones, review materials related to the *California Sportfishing Protection Alliance v. Pacific Bell Telephone Co.*; Eastern District of California Case No. 2:21-cv-00073-JDP. To develop opinions, I reviewed available reports on sampling efforts in Lake Tahoe and other information provided on two submarine telecommunications cables formerly operated by Pacific Bell Telephone Co. (Pac Bell). I also relied upon peer-reviewed literature, standard textbooks, and my decades of experience evaluating sediment and contaminant transport in surface water environments. This report presents my opinions regarding fate and transport in Lake Tahoe, California.

2 Executive Summary

In 2021 and 2023, the engineering and consulting firms Haley & Aldrich and Ramboll carried out extensive water and sediment sampling near two lead-clad telecom cables in Lake Tahoe that were formerly operated by Pac Bell. The findings from these studies indicate that lead concentrations in the water and sediment adjacent to the cables are well below regulatory standards established for the protection of human health and the environment. Specifically, the highest lead concentrations detected in water samples adjacent to the cables are significantly below both the U.S. Environmental Protection Agency's (EPA) drinking water action level and California's Proposition 65 human health-based limits. Similarly, sediment samples collected near the cables show lead levels consistent with background concentrations found in Lake Tahoe and other U.S. freshwater bodies.

This report assesses the transport mechanisms that could distribute lead within the lake, including advection and dispersion in the water column and sediment transport processes. Seasonal variations in lake circulation, driven by changes in temperature and density, influence the distribution of lead in the water column and sediment. These natural processes would be the controlling factors in the potential transport of any lead from the cables. Sediment transport studies indicate that the lake's low current velocities limit the potential for resuspension and long-distance transport of lead-contaminated sediments.

The standard advection-dispersion equation was applied to model the potential transport of lead released from the cables. The results of this analysis demonstrate that lead concentrations would decrease by more than an order of magnitude within 5 meters of the cables under all scenarios considered. The findings indicate that any lead released from the cables is quickly diluted and dispersed, without quantifiably impacting lead concentrations in more distant areas, such as the Eagle Point Campground water intake, located 350 to 400 meters from the nearest cable.

In summary, my assessment shows that the natural dispersive and sediment transport processes in Lake Tahoe significantly reduce, within a few meters, any lead concentrations that could be released from the Pac Bell cables. The report supports the conclusion that the cables do not adversely affect lead concentrations in Lake Tahoe's water or sediment.

3 Opinions

Opinion 1— Natural dispersive transport processes in the Lake Tahoe water column are responsible for the reduction in any water column lead concentrations by over an order of magnitude within 5 meters away from the Pac Bell cables.

Opinion 2— Sediment transport processes, including advection and settling, in the Lake Tahoe environment are responsible for the reduction in any suspended particulate and subsequent sediment lead concentrations by over an order of magnitude within 5 meters away from the Pac Bell cables.

4 INTRODUCTION

Pac Bell operated two submarine telecommunications cables that were located on the bottom of Lake Tahoe (Figure 1). The total length of the cables is approximately 12.5 km. The two cables share a similar layered structure common for cables in the 20th century. The cables have an outer coating of jute over 6 mm (0.25 in.) steel rods that protect the inner portion of each cable. The inner portion of each cable consists of a lead jacket with walls approximately 6 mm (0.25 in.) thick. The lead jacket protects the inner copper strands used for communication from the water. The cables are no longer operative. The two cables are still in place and one of the cables has been cut at one or both ends. The outer steel and lead sheathing has been exposed in places possibly due to external damage from boats, anchors, and other debris.

Figure 1. Approximate locations of Pac Bell Cables A and B and the Eagle Point water intake.

Previous damage to the cables and the cut ends has caused areas of lead sheathing to be exposed. Concern has been raised over the potential contamination of drinking water (*California Sportfishing Protection Alliance v. Pacific Bell Telephone Co.* 2021). The nearest water intake to the cables is the intake for the Eagle Point Campground California State Parks water system (Revchuk 2024). According to Revchuk's (2024) work, the intake is located approximately 75 m from the shoreline in 8 m of water. The Eagle Point water intake is located within 350 to 400 m of Cable A located in Emerald Bay. The goal of this work is to determine the transport potential of lead based on the information available in the vicinity of these cables.

5 LEAD SAMPLING IN LAKE TAHOE

For hundreds of years, lead has been mined, smelted, refined, and used in products (e.g., as an additive in paint, gasoline, leaded pipes, solder, crystal, and ceramics). Natural levels of lead in U.S. soils occur at a nationwide average of 26 ppm (standard deviation 185 ppm). Lead can be harmful to humans when ingested or inhaled and warrants investigation when present above background levels in the environment (USEPA 2024). In evaluating the potential for lead from the Pac Bell cables to significantly contaminate the Lake Tahoe environment (above background concentrations), it is important to understand the solubility of lead from the cables and the ambient levels of lead in the lake due to other sources.

The solubility of metals in water varies widely depending on the type of metal and the specific environmental conditions. In the natural environment, lead has low solubility in water, resulting in low surface water concentrations. In natural water bodies, such as Lake Tahoe, lead is most commonly found as particulate matter (e.g., in sediment), which further limits its solubility. Overall, the solubility of lead is very low and not generally expected to pose a significant source to surface water due to dissolution from the inert lead found in the Pac Bell cables (Thomas 2021).

In cores at 300 and 400 m depths in Lake Tahoe, Heyvaert et al. (2000) found an average lead sediment concentration of 11.7 mg/kg representing sediment concentrations prior to anthropogenic influences (circa 1850). The average sediment concentration of lead in Lake Tahoe after the pre-1850 baseline is approximately 82.6 mg/kg, a 6-fold increase from pre-industrial concentrations to modern sediment lead concentrations (Heyvaert et al. 2000). Lead concentrations are elevated in tributaries flowing into Lake Tahoe. From 2008 to 2020, California's surface water monitoring program[1] collected sediment samples from the largest tributary flowing into Lake Tahoe, the Upper Truckee River. Sediment concentrations averaged 14.7 mg/kg, ranging from 11.0 to 22.7 mg/kg, which is higher than the pre-industrial background.

Since 2021, Haley & Aldrich, Inc. (Haley & Aldrich) and Ramboll have been evaluating water and sediment quality near the two Pac Bell cables using U.S. Environmental Protection Agency (EPA) guidelines for sampling and analysis methodology (Ramboll 2023a, b; Haley & Aldrich 2024). Sampling in surface water and sediment have determined that there is no significant elevation of lead concentrations in Lake Tahoe waters or sediment associated with the cables. The highest concentrations of lead detected at close proximity to the cables were well below water quality standards or background concentrations. The sections below summarize the results of these studies.

[1] https://data.ca.gov/dataset/surface-water-ambient-monitoring-program

5.1 HALEY & ALDRICH WATER QUALITY SAMPLING

In 2021, Haley & Aldrich evaluated whether any lead being released from the cables was impacting the water quality of the lake. Haley & Aldrich selected sample locations along Cable A and Cable B that were identified as those with the highest potential for the release of lead due to direct surface water contact with lead in cables. Surface water quality samples were collected using the best available methodologies for trace analytical techniques approved by EPA. Water samples were analyzed at a laboratory in Minneapolis, Minnesota, that holds certifications from the State of California (California Certification #: 2929) and Nevada (Nevada Certification #: MN00064). This laboratory used EPA-approved methodologies for measuring trace metals in surface waters (Haley & Aldrich 2024).

The laboratory analyses for lead have a method detection limit (MDL) of 0.043 μg/L and a reporting limit of 0.10 μg/L. The reporting limit is the lowest concentration value that meets project requirements for quantitative data with known precision. Concentrations that fall between the MDL and reporting limit are estimated. Concentrations below the MDL are reported as “not detected” (ND). All total and dissolved lead data reported from the laboratory were below the reporting limit. Estimated lead concentrations (above the MDL but below the reporting limit) are more than 100 times lower than the EPA drinking water action level (15 μg/L) and are less than one-third of the Proposition 65 human health-based limit (0.25 μg/L; OEHHA 2022). Haley & Aldrich concluded that the cables are not adversely impacting the lake’s water quality in the vicinity of the cables or elsewhere and that lead concentrations in the water near the cables were consistent with or below background levels in the lake.

5.2 RAMBOLL WATER QUALITY SAMPLING

In 2023, sampling by Ramboll determined that water concentrations of lead were similar to background levels at all locations sampled, well below water quality standards. Ramboll collected water samples directly above the cables at six locations near Cables A and B and at six reference locations (Ramboll 2023a). Total and dissolved lead samples were analyzed according to standard EPA methods. The samples showed concentrations that were below the reporting limit (0.02 μg/L) or the MDL (0.006 μg/L) for the laboratory used by Ramboll (ALS).

The lead concentrations detected at close proximity to the cable (0.027–0.064 μg/L) were more than 200 times below the EPA’s drinking water action level for lead (15 μg/L) and were less than one-third of the Proposition 65 human health-based limit (0.25 μg/L; OEHHA 2022). At all locations sampled, the concentrations of lead were consistent with background levels reported in Chien et al. (2019), which reports trace metal concentrations and lead isotope ratios in lake water, river water, and groundwater in the Tahoe Basin. Trace metal concentrations varied seasonally but were homogenous throughout the lake water column. Based on the results of their sampling and analysis, Ramboll concluded that the water quality of Lake Tahoe is not being adversely impacted by the cables (Ramboll 2023a).

5.3 RAMBOLL SEDIMENT SAMPLING

Ramboll also undertook a sediment investigation in 2023 to determine the potential for the Pac Bell cables in Lake Tahoe to contribute to lead concentrations in sediment. The results of this study determined that lead concentrations in nearshore Lake Tahoe sediment were below regulatory standards at all locations sampled. Ramboll also sampled six sediment stations near the cables (Ramboll 2023b). Three stations were adjacent to Cable A and three stations were adjacent to Cable B. In addition, samples were collected at three reference stations and four beach stations. For each of the cable and reference stations, the team returned to the same locations as those used in the Ramboll 2023 water sampling study. The sediment laboratory analysis was conducted by ALS and was completed according to EPA and ASTM International guidance (Ramboll 2023a).

The lead concentrations in sediment were low at all measured locations, including cable, reference, and beach stations. The highest concentrations (7.57 and 5.57 mg/kg) were found below the cut ends of the cable where the lead sheath was exposed and are well below background sediment concentrations in Lake Tahoe (11.7 mg/kg). The National Oceanic and Atmospheric Administration (NOAA) has published general toxicity reference levels for lead in freshwater sediment across the U.S. (Buchman 2008). NOAA reported that "background" lead concentrations in freshwater sediment range from 4 to 17 mg/kg. As noted, Heyvaert et al. (2000) found an average lead concentration of 11.7 mg/kg of lead in deep cores from lake sediment at 300- to 400-meter depths representative of pre-anthropogenic influence. All of the measured concentrations were well within the range of expected background levels of lead for freshwater sediment both in Lake Tahoe and across the U.S. Furthermore, all lead concentrations found in the study were below published ecological toxicity thresholds (31 to 250 mg/kg) indicating that they do not present an ecological risk to biota of Lake Tahoe (Ramboll 2023a; Buchman 2008).

5.4 FIELD SAMPLING SUMMARY

Overall, the Ramboll and Haley & Aldrich data show that there are no elevated concentrations of lead in the water column or sediment adjacent to the Pac Bell cables and that any lead release from the cables to sediment is minimal. Measured water and sediment concentrations are below or within accepted water quality standards or background ranges. The highest measured surface water concentrations of lead near the cables are well below EPA drinking water level for lead (15 µg/L) and within the Proposition 65 human health-based limit (0.25 µg/L; OEHHA 2022). The highest measured lead concentrations in sediment near the end of the cables (7.57 mg/kg) are significantly lower than the average lead concentrations measured in sediment in the lake's largest tributary (14.7 mg/kg). Lead concentrations in sediment and water are well below regulatory thresholds. Lead concentrations in the water and sediment vicinity of the cables are generally indistinguishable from background and the cables do not adversely influence lead concentrations in Lake Tahoe water or sediment.

6 TRANSPORT IN LAKE TAHOE

The transport of lead in Lake Tahoe through the water column and sediment is dependent on the circulation and sediment transport patterns in the lake. Lake Tahoe, like most alpine lakes, experiences distinct seasonal circulation patterns due to temperature variations and changes in density stratification (Håkanson and Jansson 1983). During spring and summer, Lake Tahoe exhibits strong thermal stratification, with a warm surface layer, a cool deep layer, and a thermocline, the layer separating warmer surface water from cooler deep water. In winter and fall, cooling and wind-driven mixing lead to more uniform temperature profiles and the mixing of the entire water column. Wind-driven currents at the surface can induce horizontal flows across the lake. These currents typically range from 1 to 10 cm/s, but strong winter storms can generate higher velocities (Schladow and Hamilton 1997; Schladow and Jassby 2001; Jassby et al. 1999; Roberts et al. 2019; Steissberg et al. 2005).

Sediment transport in Lake Tahoe involves a combination of processes that affect the transport and deposition of sediment within the lake. These processes are influenced by the water column circulation, wind, wave action, and inflow from tributaries. Sediment is transported into Lake Tahoe primarily through tributaries, especially during periods of high discharge such as spring snowmelt and heavy rainfall events. The Upper Truckee River is one of the major contributors of sediment to the lake. These fine particles remain suspended in the water column and can be transported long distances within the lake before settling. Wind generates waves on the surface of the lake, which can resuspend sediment from the lakebed in shallow areas. The following sections describe these seasonal transport processes in more detail.

6.1 WINTER

During winter, the surface waters of Lake Tahoe cool and become denser. This cooling process causes the surface water to sink, promoting vertical mixing throughout the lake. This phenomenon, known as the winter overturn, can result in the entire water column becoming well-mixed and isothermal (same temperature throughout), although the lake can remain weakly stratified during mild winter periods. The lake water temperature becomes relatively uniform from the surface to the bottom, typically around 4°C. Wind-driven currents at the surface can induce horizontal flows across the lake. These currents typically range from 1 to 10 cm/s, but strong winter storms can generate higher velocities. Winter mixing can redistribute sediment within the lake; but this is generally a time of low sediment transport until the spring snowmelt occurs (Jassby et al. 1999; Roberts et al. 2019; Steissberg et al. 2005).

6.2 SPRING

As temperatures rise in the spring, the surface water begins to warm. However, the deeper water remains cool. This warming process initiates the formation of a thermocline, a distinct layer where the temperature gradient is steepest. The difference in temperature (and therefore density) between the surface and deeper waters increases, leading to the development of thermal stratification. The warmer, less dense water stays on top, while the cooler, denser water remains below.

Wind-driven currents are again a major factor, with typical speeds of 1 to 10 cm/s (Jassby et al. 1999; Roberts et al. 2019; Steissberg et al. 2005). During these periods, internal waves (seiches) can also form due to the oscillation of the thermocline, leading to complex horizontal flows and rotational wave patterns. These flows can redistribute sediment in the water column and transport it out to deeper water where it deposits. Overall, the largest source of sediment is from tributaries to Lake Tahoe during periods of high discharge associated with spring snowmelt and heavy rainfall events. Sediment from inflows is generally redistributed to and deposits in deeper regions of the lake where currents are the lowest.

6.3 SUMMER

During summer, the surface waters continue to warm up, reaching temperatures of around 20°C or higher, while deeper waters remain cold, around 4°C–5°C. The thermocline becomes well-defined and stable. This stratification limits vertical mixing, which can affect nutrient distribution and biological activity within the lake. During summer, when the lake is strongly stratified, surface currents driven by wind can be more pronounced. These currents typically range from 1 to 10 cm/s but can occasionally reach higher speeds during strong wind events (Jassby et al. 1999; Roberts et al. 2019; Steissberg et al. 2005).

Sediment transport in the summer is primarily influenced by surface currents during strong wind events. Lower inflow rates from tributaries during summer reduce the amount of new sediment entering the lake; therefore, there is low overall transport of sediment occurring.

6.4 FALL

As fall arrives, the surface waters start to cool down. The cooling increases the density of the surface water, which begins to sink, gradually eroding the thermocline. The cooling and sinking process ultimately leads to weakening of thermal stratification, which is often further weakened by wind-driven mixing. Eventually, the lake may undergo a turnover, similar to the winter overturn, where the entire water column mixes, redistributing nutrients and oxygen throughout the lake. Wind-driven currents are again a major factor, with typical speeds of 1 to 10 cm/s (Jassby et al. 1999; Roberts et al. 2019; Steissberg et al. 2005). Fall storms can cause increased sediment input from tributaries. Sediment redistribution can occur due to wave

action and currents, which leads to erosion of shallow shoreline regions and resuspension of sediment.

6.5 SEDIMENT TRANSPORT ZONES

Sediment transport dynamics in Lake Tahoe can be divided into two zones: the nearshore (less than a few meters in depth) and deepwater zones. Nearshore areas often have sandy and coarse-grained sediment where wind and wave action regularly resuspend fine-grained sediment, such as silts and clays, and transport it to deepwater zones where wave action is reduced and the fine sediment can deposit. In deeper parts of the lake, where currents are weaker, fine-grained sediment settles and accumulates. These areas serve as long-term sediment sinks and preserve sediment profiles such as those investigated by Heyvaert et al. (2000).

Generally, Lake Tahoe is characterized by low currents (< 10 cm/s) and a depositional sedimentary environment. In the nearshore regions, mixing and coarsening of surface sediment maintain coarse-grained sediment composition. The relatively shallow depth regions where the Pac Bell cables are located are not expected to experience high currents or transport with the exception of occasional wave action in the nearshore region. The persistence of these cables at the lakebed surface over many decades is evidence that they do not experience significant transport that would result in cable scouring or burial as is common in other high transport environments.

7 TRANSPORT OF LEAD

The Advection-Dispersion Equation (ADE) is commonly used to describe contaminant transport in lake systems because it effectively captures the key processes that influence how contaminants move and spread within the water body. Advection represents the transport of contaminants by the bulk movement of water or sediment in the water column. In Lake Tahoe, this can be due to currents driven by wind, inflows and outflows, and density-driven flows described in the previous section. The advective component of the ADE captures the directional movement of contaminants, which is essential for understanding how pollutants transport in the lake environment. The dispersion component accounts for the spreading of contaminants due to molecular diffusion and turbulent mixing (associated with variations in water velocity).[2] The dispersion component of the ADE models how contaminants spread from areas of higher concentration to areas of lower concentration, accounting for the mixing processes that occur within the lake. The advection and dispersion relationships hold for both particulate (i.e., suspended sediment) and dissolved material in the water column. When applied to sediment transport without a sediment settling term, the results produce conservatively high transport predictions for contaminant concentrations. Overall, the ADE is commonly used to describe the potential for substances to transport in the aquatic environment (Fischer et al. 1979; Thomann and Mueller 1987; Chapra 2008).

7.1 STEADY-STATE ADVECTION-DISPERSION EQUATION

For steady-state conditions (no variation over the time of interest), and assuming advection is primarily in a uniform direction over that time, the 2-dimensional ADE equation is:

$$u\frac{\partial C}{\partial x} = D\left(\frac{\partial^2 C}{\partial x^2} + \frac{\partial^2 C}{\partial z^2}\right) + q \qquad (1)$$

where:

C = concentration of the substance
u = advective velocity in the *x* direction
D = dispersion coefficient
q = source term

The steady 2-D equation assumes the vertical velocity in the *z* direction is 0 and the dispersion coefficient is constant in *x* (horizontal) and *z* directions (vertical). The steady 2-D advection and dispersion equation describes both horizontal (*x*) and vertical (*z*) transport from a point source or line source (e.g., cable lying on the sediment bed).

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[2] Molecular diffusion is typically orders of magnitude smaller than turbulent dispersions in natural aquatic systems.

For a point source (or line source), such as the Pac Bell cables in Lake Tahoe, with a source strength q (mass per time), the steady-state solution for the 2-dimensional ADE can be represented using the Green's function. The simplified solution is:

$$\mathrm{C(x,z)} = \frac{\mathrm{q}}{4\pi DR} \exp\left(-\frac{u(x-x_o)}{4\pi D}\right) \qquad (2)$$

where $\mathrm{R} = \sqrt{(\mathrm{x}-\mathrm{x_o})^2 + (z-z_o)^2}$ and is the radial distance from the source at location ($\mathrm{x_o}, \mathrm{z_o}$; e.g., the location of the cable on the lakebed).

The predictive capability of the ADE allows for the simulation of how contaminants will move and change concentration away from the potential source, aiding in the prediction of contaminant fate and transport. This predictive capability is crucial for environmental management. Utilization of the ADE also assists in environmental impact studies, assessing risks to aquatic life by predicting the spread and concentration of harmful substances and ensuring that contaminant levels remain within regulatory limits (Fischer et al. 1979; Thomann and Mueller 1987; Chapra 2008). Using the ADE to describe lead transport in the Lake Tahoe system allows for a detailed and accurate representation of the processes that control the movement and fate of lead in the lake to allow for a better understanding of the potential impact of the cables to locations away from the cables.

7.2 ADVECTION-DISPERSION CALCULATIONS

In solving equation 2 above for concentration profiles, it is important that the parameters (i.e., *D* and *u*) are chosen to best represent the conditions in the system, in this case, Lake Tahoe. The natural dispersion coefficient (*D*) for lakes, including Lake Tahoe, can vary based on several factors like depth, wind patterns, and water flow. In general, dispersion coefficients in lakes can range from approximately 0.1 m^2/s to 1.0 m^2/s for horizontal dispersion (Fischer et al. 1979). Also, as seen in Section 5, the advective velocity (*u*) in Lake Tahoe is typically less than 0.1 m/s (10 cm/s). With these parameters, we can bound the solution to the ADE for Lake Tahoe using the ranges listed below.

- *q* = 1.0—The source strength (kg/s) is chosen as a unit value of 1 that is simply used to represent a value to determine the percentage of the initial concentration at the cable at various distances away from the cable.
- *D* = 0.1, 0.5, and 1.0 m^2/s—The dispersion coefficient is varied from 0.1 to 1.0 m^2/s to explore the reasonable range of dispersion coefficients for Lake Tahoe (Fischer et al. 1979).
- *u* = 0.0, 0.1, and 0.15 m/s—The water column velocity in the horizontal direction is varied from 0.0 to 0.15 m/s to explore the effects of velocity on the movement of contamination in Lake Tahoe (Roberts et al. 2019; Steissberg et al. 2005).

Equation 2 was solved using Python for the parameter sets above to determine the contaminant advection and dispersion from the cable locations. The resulting concentrations in the horizontal and vertical in the system are representative of the fraction of the initial concentration at the contaminant source to facilitate the assessment of potential advection and dispersion transport from the cables in Lake Tahoe.

The fraction of initial lead concentration is shown for increasing horizontal velocity in Figure 2 through Figure 4. The concentration decreases more than 10 times (an order of magnitude from 1 to well below 0.1) from the maximum concentration within 5 m demonstrating the rapid dispersion and limited transport of material. Figure 5 and Figure 6 show ADE results when dispersion is set to 0.1 or 1.0 m^2/s and demonstrate a substantial decrease in the source concentration within a few meters of the source. Overall, for all of the cases considered, concentrations decrease by an order of magnitude (or more) within 5 m distance from the cable.

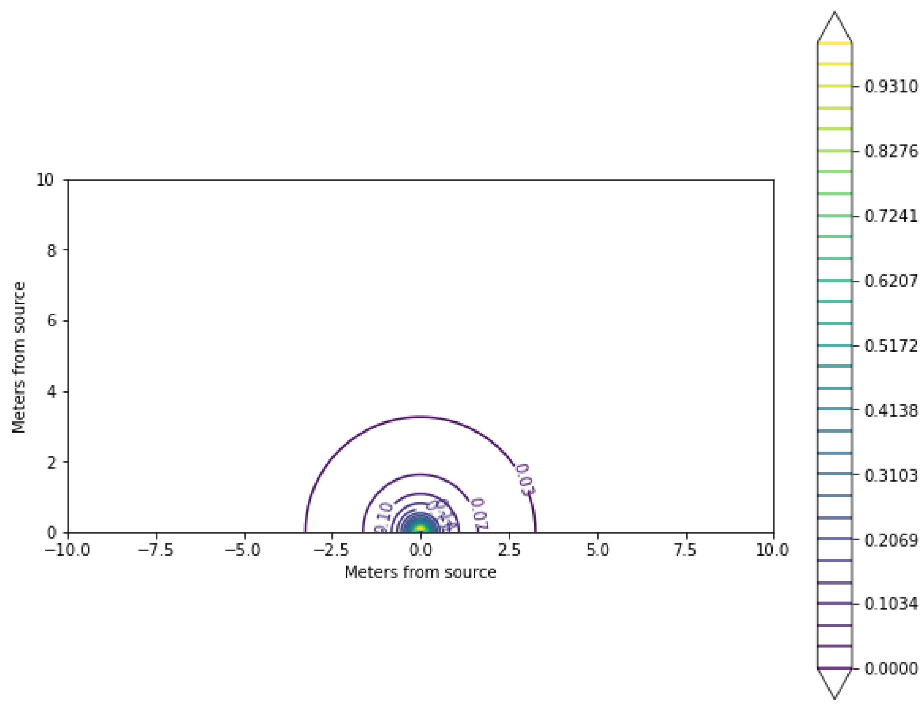

Figure 2. Concentration contours (presented as fraction of source concentration) for D=0.5 m^2/s and u=0.0 m/s.

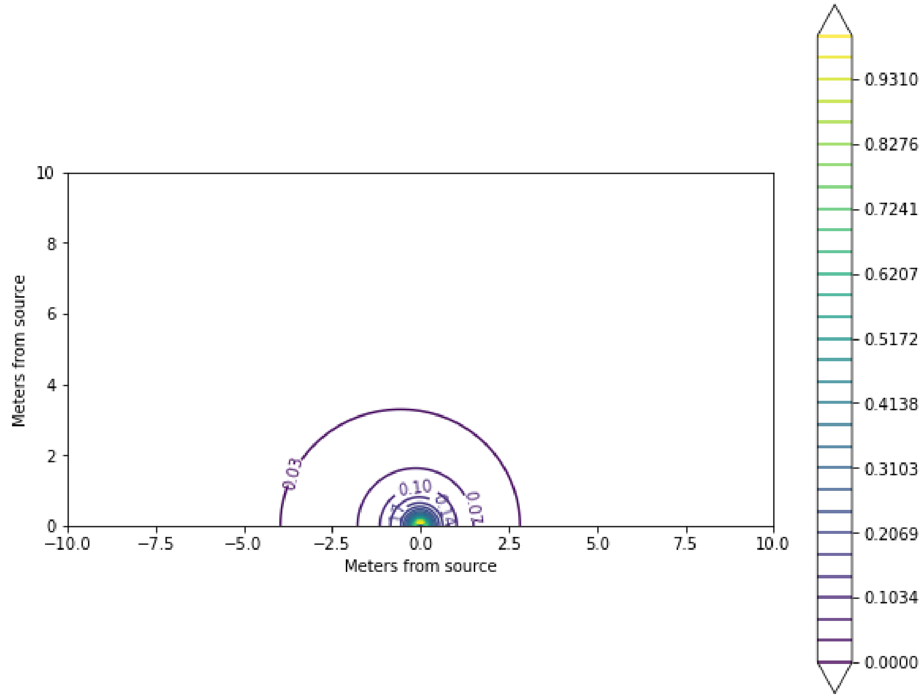

Figure 3. Concentration contours (presented as fraction of source concentration) for D=0.5 m^2/s and u=0.10 m/s.

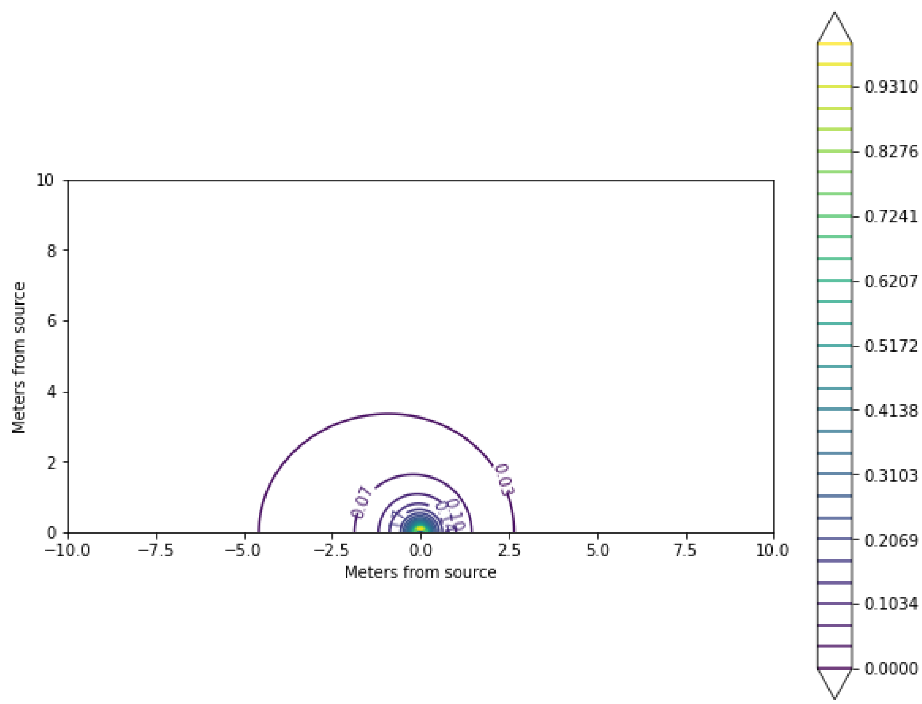

Figure 4. Concentration contours (presented as fraction of source concentration) for D=0.5 m^2/s and u=0.15 m/s.

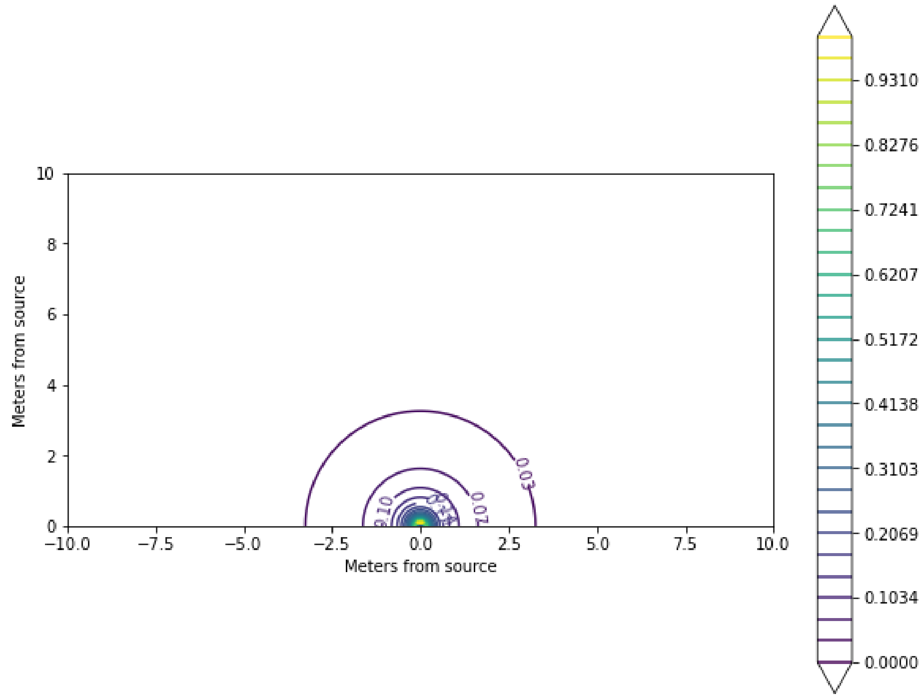

Figure 5. Concentration contours (presented as fraction of source concentration) for D=0.1 m^2/s and u=0.0 m/s.

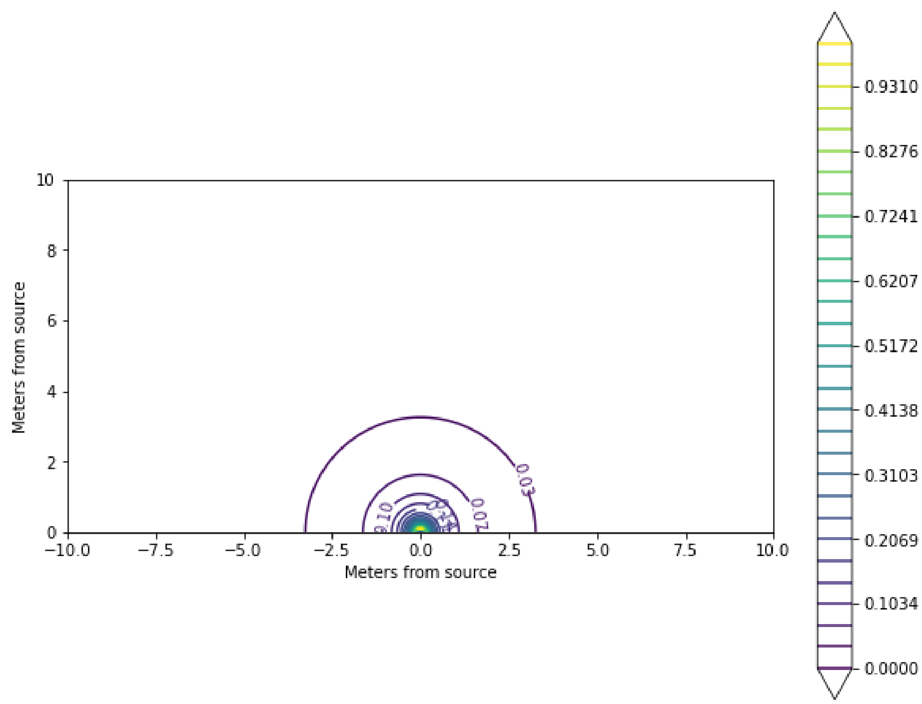

Figure 6. Concentration contours (presented as fraction of source concentration) for D=1.0 m^2/s and u=0.0 m/s.

To interpret the transport potential of lead away from the cables from the ADE calculations, a 10 m offset line is shown as a distance reference on both sides of each cable in Figure 7. The ADE calculations demonstrated that the concentrations decreased by an order of magnitude or more within 5 m of the cable location for all cases considered. Figure 7 also shows the approximate cable locations relative to the water intake. The Eagle Point water intake is approximately 350 to 400 m from the nearest cable. The results of the above analysis demonstrate that any lead released from the cables is quickly diluted and dispersed, without quantifiably impacting lead concentrations in more distant areas, such as the Eagle Point water intake, located 350 to 400 meters from the nearest cable.

Figure 7. Cables A and B shown with a 10 m buffer line for distance reference.

7.3 SEDIMENT TRANSPORT CONSIDERATIONS

Sediment transport processes could have the potential to resuspend lead particulates and/or lead that has become associated with the natural sediment from the Lake sediment bed. As seen in Section 5, there are active sediment transport processes in the Lake that generally lead to a net deposition in the lake. For sediment with elevated lead concentrations to pose a risk beyond the immediate vicinity of the cable location, contaminated sediment would need to be resuspended or eroded into the water column, and then transported to a location where it may

pose a risk (e.g., a water intake). To evaluate this, the potential for erosion and transport was assessed.

The critical shear stress is the stress at which sediment is mobilized from the sediment bed. For fine sediment, a conservatively low critical shear stress is 0.1 Pa (Blake et al. 2004). To exceed the critical shear stress and mobilize fine material, the near lakebed fluid velocity must exceed approximately 0.15 m/s (15 cm/s). As seen in the studies cited in Section 6, velocities rarely exceed 0.10 m/s (10 cm/s) at the lakebed in Lake Tahoe. However, assuming that sediment would be resuspended, the suspended sediment then transports in the water column due to the same processes described in the ADE. Therefore, the transport of suspended sediment concentrations would follow a pattern described in Figure 4 for 0.15 m/s. The transport of sediment would be limited by the settling of any particulate lead or sediment associated lead back to the sediment bed such that the ADE solutions presented above provide conservatively high estimates for sediment or particulate transport. Overall, sediment transport processes, including advection and settling, would be responsible for the reduction in suspended particulate and subsequent sediment lead concentrations by over an order of magnitude within 5 meters away from the Pac Bell cables.

8 Summary of Opinions

In summary, the measurements of lead in water and sediment in Lake Tahoe combined with reasonable transport parameters show the following:

- Measured lead concentrations in the Lake Tahoe water column and sediment adjacent to the Pac Bell cables are well below levels of regulatory concern.
- Transport of material suspended in the water column under the range of conditions seen in Lake Tahoe results in reductions in concentration by more than 10 times from the concentrations at the cable within 5 m.

These observations lead to the following opinions on the fate and transport of lead from the Pac Bell cables in Lake Tahoe.

Opinion 1— Natural dispersive transport processes in the Lake Tahoe water column are responsible for the reduction in any water column lead concentrations by over an order of magnitude within 5 meters away from the Pac Bell cables.

Opinion 2— Sediment transport processes, including advection and settling, in the Lake Tahoe environment are responsible for the reduction in any suspended particulate and subsequent sediment lead concentrations by over an order of magnitude within 5 meters away from the Pac Bell cables.

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Appendix A

Curriculum Vitae of Craig A. Jones, Ph.D.

CRAIG A. JONES, PH.D.

Managing Principal

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Dr. Craig Jones serves as the managing principal for Integral's Marine, Coastal, Climate, and Technology Services. With more than two decades in the field, he specializes in engineering and scientific projects aimed at understanding challenges at offshore sites for both governmental bodies and private enterprises. His experience spans riverine, lacustrine, estuarine, and coastal processes, delving deep into hydrodynamics, wave dynamics, and sediment and contaminant transport. He is widely recognized for employing cutting-edge field measurements and modeling techniques to deeply understand aquatic systems. He plays an instrumental role in designing field operations and tools to gather information critical to client needs. Furthermore, Dr. Jones excels in assimilating this information into varying analytical frameworks, ranging from empirical to numerical models, ensuring that each project meets the highest quality standards while being efficiently managed. He has testified in federal court and in front of public utility commissions as an expert on environmental issues and regulatory concerns, including sediments and contaminants in support of allocation activities. Dr. Jones continues to work on preparation of materials for various environmental litigation cases in the United States.

Relevant Experience

OFFSHORE ENERGY

Offshore Wind Benthic Baseline Studies, East Coast, United States — On behalf of confidential commercial developers, served as technical lead on the design and implementation of benthic community baseline surveys for lease areas located off Massachusetts, New York, New Jersey, Delaware, and Rhode Island. Responsible for technical oversight and quality assurance of seabed survey activities, data interpretation, and reporting.

Acoustic Noise Modeling from an Offshore Energy Array and Its Impact on Marine Mammals — Served as a technical lead on an environmental case study of the PacWave South marine energy site off the coast of Newport, Oregon, using hydroacoustic modeling in a 3-dimensional marine environment. Sound pressure levels were used to predict marine mammal acoustic impact metrics (AIMs). The project combined two AIMs, signal to noise ratio and sensation level, into a new metric, the effective signal level (ESL), which is a function of propagated sound, background noise levels, and hearing thresholds for marine species and is evaluated across 1/3 octave frequency intervals. The ESL model is used to predict and quantify the potential impact of an anthropogenic signal on the health and behavior of a marine mammal species throughout the area.

Environmental Baseline Surveys, Mexico — Serving as principal in charge of field studies in support

Education & Credentials

Ph.D., Mechanical and Environmental Engineering, University of California, Santa Barbara, California, 2000

M.S., Fluid Mechanics (minors: Environmental Ocean and Environmental Engineering) University of California, Santa Barbara, California, 1996

B.S., Coastal Engineering, Texas A&M University, Galveston, Texas, 1994

Professional Affiliations

American Society of Civil Engineers

Marine Technology Society

American Geophysical Union

American Shore and Beach Preservation Association

Achievements & Awards

United States Utility Patent No. 61/857,057 (provisional). A device and method for measuring wave motion.

Recipient of J.C. Stevens Award, recognizing excellence in a paper published by the American Society of Civil Engineers. The paper is in the field of hydraulics, including fluid

mechanics and hydrology. See Jones and Gailani (2009) below.

of environmental site characterization and risk assessment for oil and gas leases in the deep and shallow waters of the Mexican Gulf of Mexico. The Mexican regulatory agencies require extensive environmental baseline surveys and risk assessments for the lease blocks that have been auctioned in recent years. Supporting the developers with field assessment through offshore sampling activities, which include sediment profile imagery collection and analysis. The work is being submitted to both industry and Mexican government agencies. Continually developing management procedures to assist with increasing the utility while reducing the costs of these activities for industry.

Platform Usumacinta Investigation, Gulf of Mexico, Mexico — Conducted a geophysical survey and a seafloor geotechnical sampling program to investigate shallow soil conditions near a mat-supported drilling rig and offshore platform that encountered a failure in 2007. This study presented the results of a field and laboratory program to investigate the geotechnical engineering properties of the site for a forensic evaluation of the failure. Overall operational conditions and pre-conditioning of the seafloor in the region coupled with a large storm event contributed to the failure. The team made recommendations that could be used in future operations.

Deepwater Pipeline Assessments, Gulf of Mexico, United States — Served as lead for the development of an assessment framework to determine risk to deepwater pipelines in furrowed regions near the Sigsbee Escarpment as part of a joint industry project. The deepwater furrow fields are maintained by strong currents in the vicinity of the escarpment that present a dynamic risk of spanning and vortex induced vibration to subsea infrastructure in the region. Spatial maps of risk for pipeline spanning over time were developed to determine the best routes for pipelines and effective forms of mitigation where necessary.

Improving the Efficiency and Effectiveness for Marine Hydrokinetic Permitting — Served as a technical lead for developing a toolkit and engagement for success package increasing regulators' understanding of marine energy projects, devices, and their potential environmental impacts while reducing permitting time and costs of marine energy projects. Developed an easily accessible online toolkit that integrates relevant regulatory, scientific, and spatial marine energy data. Working with a team of consultants, communications professionals, data analysts and others to conduct in-person meetings and webinars with relevant regulators from federal and state agencies to share and gather input on the toolkit and share experts' understanding of potential impacts and the state of known/unknown science for marine energy projects.

Marine and Hydrokinetic Energy Market Acceleration and Deployment — Served as technical lead for modeling of the effects of nearshore wave propagation due to the presence of offshore energy arrays. Evaluated array-specific wave model function and operation. Performed sensitivity analyses of numerical wave models to offshore wave conditions, model parameters, and array characteristics. Executed wave models over various offshore wave conditions for evaluation of nearshore wave propagation in the presence and absence of modeled wave energy conversion devices.

Real-Time Wave Assessment Tool — As co-principal investigator, developed an ocean wave buoy capable of measuring and wirelessly relaying real-time wave data in support of the design, siting, and performance optimization of ocean energy conversion systems. Performed research on wave parameter measurements and calculations. Developed and tested algorithms for computation of wave height, period, and direction from high frequency global positioning system data and accelerometer, gyroscope, and magnetometer data. Validated algorithms on a specially designed wave buoy validation stand. Completed several field data collection experiments. This project resulted in the commercialization of the Spotter wave measurement buoy.

Marine Renewable Energy Support, Sandia National Laboratories — Serving as program manager for the development of tools and techniques to improve performance, lower costs, and accelerate the deployment of marine and hydrokinetic energy technologies. The project has evaluated all aspects of marine and hydrokinetic resource characterization and environmental evaluations, through applied research and developing tools and methods to improve device performance and minimize environmental disturbance. Of particular importance to this project is the development and application of software tools and guidance for the marine renewable energy industry.

SEDIMENT FATE AND TRANSPORT STUDIES

Matilija Dam Removal Ecosystem Restoration, Ventura, California — Served as the lead modeler and project manager for the dam removal project. Removal of the Matilija Dam has the potential to provide much-needed sediment to the Ventura River Lagoon and the coastal ocean, restoring critical habitat. To evaluate the influences of the restored sediment loading to the lagoon and nearshore habitats, a suite of sediment transport modeling tools is being employed to characterize both the initial sediment pulse released from dam removal and the subsequent restored river sediment loads. Used these modeling tools to evaluate changes in water quality and to evaluate shoreline and nearshore habitat evolution under the joint effects of the Ventura River watershed, wave and tidal ocean processes, and sea level rise. The dam removal project and associated modeling are part of a comprehensive long-term effort to support ecosystem restoration of the Ventura River watershed for multiple benefits.

San Mateo Vulnerability Assessment and Adaption Plan, San Mateo County, California — Involved in vulnerability assessment and adaption plan development for southern San Mateo County to respond to sea level rise and supported AB 691 development based on California State Lands Commission guidance.

Contaminated Sediment Transport Evaluation, Berry's Creek Study Area, New Jersey — Serving as project manager for field and modeling studies related to the risk assessment and remedial investigation of the Berry's Creek Study Area (BCSA) wetland in New Jersey. The BCSA is a tidal wetland/marsh adjacent to the Hackensack River. Historical releases of contaminants into the BCSA have resulted in the need for an RI/FS for the site. The study goals are to characterize the fate and transport of sediment-bound contaminants. Responsibilities include the design and implementation of the sediment transport investigation for the site. Implemented the field investigation, maintaining five permanent current and water quality monitoring stations while also employing real-time storm monitoring using vessel-mounted systems. The data are being used to develop a quantitative description of hydrodynamics and sediment transport in the system, providing contaminant fate and transport input to the risk analysis and remedial selection and design.

United Heckathorn Superfund Site, Richmond, California — Served as project manager for a DDT fate and transport study that was performed for the Lauritzen Channel as part of a focused feasibility study. The objectives were to develop a quantitative contaminant fate and transport conceptual site model and DDT mass balance for the Lauritzen Channel, based on available analyses, and assess trends in DDT mass and concentration in the channel. Overall, the sediment transport analysis showed that the Lauritzen Channel is accumulating relatively clean sediment from San Francisco Bay. There are distinct regions with different sediment transport and accumulation characteristics in the channel that were characterized. For example, the west side of the channel, which experiences the highest vessel activity in relatively shallow regions, was investigated through the use of propeller scour modeling. The results of the analysis showed overall that the average DDT concentrations in the young bay mud

sediment are decreasing in the channel.

Development of a Guide for Assessing Sediment Transport at Navy Facilities, U.S. Navy — Authored a U.S. Navy guidance document to ensure that sediment investigations and remedial actions are successful and cost effective. The guidance provides information on evaluating sediment transport at contaminated sediment sites, and describes how to use sediment transport information to support sediment management decisions. The framework developed in this report has been applied at three demonstration sites: Hunters Point Naval Shipyard (HPS) in San Francisco, California; Bremerton Naval Complex in Puget Sound, Washington; and Naval Station Newport in Newport, Rhode Island.

Development of a Real-Time Wave Assessment Tool, ARPA-E, U.S. Department of Energy — Supporting wave energy converter (WEC) development by collaborating with key WEC technologists to develop, test, and validate a wave measurement buoy that will be capable of providing real-time wave-by-wave information. This could increase WEC capture efficiency by up to 330 percent, potentially reducing the cost of wave power below $0.10 per kWh. Was primary inventor of transformational technology that can be networked to measure and relay real-time wave properties at a fraction of the cost of current systems.

Hamilton Wetland Restoration, San Pablo Bay, California — Served as project manager for the assessment of an open-water dredge material storage facility for beneficial reuse and restoration of Hamilton Wetlands in California. Evaluations were conducted for a temporary dredge material transfer facility in San Pablo Bay to support the restoration at the former Hamilton Army Airfield and surrounding land. The aquatic transfer facility (ATF) is designed to handle 24 million cubic yards of material over a 10- to 15-year operational life. Knowledge of the fate of the dredged material in and around the ATF, developed using SEDflume and modeling studies, was critical to the selection of an optimal location for the ATF, and for guiding the design and configuration so that impacts to the surrounding environment will be minimized.

Sediment Transport Investigation, Lower Passaic River, New Jersey — Led the development of a conceptual site model of sediment transport in the Passaic River. Historically, the Lower Passaic River below the Dundee Dam has been contaminated with a range of contaminants of potential concern. Since the most significant transport pathway for these hydrophobic contaminants is by transport of the sediments to which they are sorbed, sediment transport is a key system-wide process to understand when evaluating environmental risk and any remedial selection. Led the preparation of documents detailing the sediment transport processes important to the site while providing technical review of sediment transport analyses being conducted by EPA.

Remedial Investigation and Feasibility Study, Hunters Point Naval Shipyard, California — During the feasibility study phase of the work at HPS, provided the U.S. Navy with advice and analysis regarding the stability of PCB-contaminated sediments onsite. The work included the development of an agency-approved work plan, collection of cores for SEDflume analysis, and analysis of data to provide a "weight of evidence" approach to sediment stability at HPS. Managed field work and analysis associated with the sediment and contaminant transport investigation, and acted in a technical advisory capacity to the U.S. Navy and local and federal regulatory agencies. Managed the evaluation of the mobility of bottom sediment in areas of potential chemical contamination in the vicinity of HPS, in south San Francisco Bay, California. Also performed analysis of PCB releases into the bay, which were utilized in the feasibility study to select remedial options.

Dredge Disposal, Santa Cruz, California — Co-managed the design and implementation of the third inner Santa Cruz Harbor dredge monitoring program. Before these dredge monitoring programs, it was

considered too great a risk to release sediment containing more than 20 percent mud into the surf zone because it might have damaging effects on the coastal environment. The project demonstrated negligible sedimentary changes occurred on the beaches and in nearshore benthic habitats of the Santa Cruz Bight during the dredging period. A variety of data collection efforts were utilized to monitor the experimental dredging event, including local stream flow, wave, and current data collection; beach and offshore sediment sampling; pre- and post-dredging multi-beam surveys and benthic habitat mapping; and sediment transport modeling.

DDT Transport Investigation, Lago Maggiore, Italy — Served as project manager for a DDT transport investigation of the Toce River, Lake Mergozzo, and Lago Maggiore. The investigation was conducted to better understand hydrodynamic processes and the stability of sediments and contaminants in the area. Led the field investigation and modeling team and development of state-of-the-art, 3-dimensional, hydrodynamic and sediment transport models to investigate sediment transport in the Toce River and depositional patterns in Lago Maggiore. The model was successfully used to evaluate the patterns of contaminant deposition. The data were used to develop a risk assessment for the site.

Sediment and Contaminant Transport Investigation, Augusta Bay, Sicily, Italy — As a part of the Augusta Bay contaminated sediment investigation, developed and implemented a study to gain a better understanding of the transport of sediments and contaminants in the bay. The study goals were to develop a conceptual site model describing the key site processes and compile and collect site data to provide an adequate understanding of these processes. Led the field investigation and modeling team and developed a quantitative conceptual site model and state-of-the-art, 3 dimensional, hydrodynamic and sediment transport models to investigate sediment transport in Augusta Bay. A key process of interest was propeller scour during ship motion. Developed innovative techniques to determine sediment resuspension during ship movement events. The data and analysis were being used to develop remedial alternatives for evaluation in a feasibility study.

Remedy Effectiveness Monitoring, Anacostia River, Washington, DC — Managed the analysis of sediment stability in the vicinity of the Washington Navy Yard on the Anacostia River to provide a better understanding of the integrity of capping material and transport of contaminants of potential concern at the site. The studies provided rationale for the field study design, specifically selection of locations for sediment erosion rate measurements using SEDflume and current measurements using Acoustic Doppler Current Profiler deployments. The study focused on the collection and analysis of data to assess the remedial options of capping and monitored natural recovery employed at the site. Also performed a numerical analysis of sediment transport on the native and capped material using typical and extreme hydrodynamic conditions in the Washington Navy Yard region.

Contaminated Sediment Dredging, Ashtabula River, Ohio — An environmental dredging and disposal project was conducted by EPA to remove PCB-contaminated sediments from the Ashtabula River. Served as a technical lead in a program that was implemented to determine the nature and source of contaminated residuals during a typical dredging operation. Led efforts to monitor water quality and bathymetric variability during the Ashtabula River navigational and environmental dredging and disposal project. Conducted both fixed and mobile current and water quality measurements near the dredging operations. In addition, water quality moorings were deployed upstream and downstream of the project to measure background conditions at the project extents. Conducted analysis to determine the nature and source of residuals post-dredging.

Technical Advisor, San Francisco Estuary Institute — Acted as an advisory member of a contaminated sediment advisory group for the Estuary Institute. In addition, continue to provide technical advice on

the development of modeling studies to evaluate water quality issues in the San Francisco Bay region.

Evaluation of Sediment Transport, Chalk River Laboratories, Atomic Energy of Canada Limited — The Ottawa River contains a region of sediment offshore of Atomic Energy of Canada Limited's Chalk River Laboratories that has been shown to have above background levels of radioactivity, some of which is in the form of sand-sized radioactive particles. The sediments have been evaluated in past studies and do not currently pose a direct environmental or human health threat; however, assessments of human health risk must consider the possibility of sediment erosion and transport to shallow water areas. Responsible for investigating sediment erosion potential and sediment transport trends in the vicinity of the contaminated footprint. Initial studies were conducted using numerical models to predict river hydrodynamics, wind-wave production, and general sediment transport trends. The hydrodynamic model was refined using high-resolution bathymetry, and sediment erosion studies were conducted on the site's sediments; the sediment was found to be at low risk of transport during extreme events.

Dredge Material Transport, Delong Mountain Terminal, Alaska — Managed a project evaluation of erosion of a dredged material mound near the Delong Mountain Terminal in northwest Alaska, which is subject to various storm events. The evaluation was based on the combined hydrodynamics of Environmental Fluid Dynamics Code and the sediment transport algorithms of SEDZLJ. To help evaluate the physical processes and possible impacts due to dredge material placement from the Delong Mountain Terminal Navigation Improvements Project, a numerical modeling analysis of dredge mound erosion and transport was conducted. The model assisted the U.S. Army Corps of Engineers in developing the optimal methods and locations for dredge material placement to minimize future erosion and subsequent channel infilling.

Prediction of Optical Variability in Dynamic Nearshore Environments, Santa Cruz, California — The objective of this project was to develop a system for forecasting marine optical conditions in the surf zone for the purpose of improving naval operations. Successful, rapid identification of mine-like objects in nearshore coastal oceans is critical for safe passage of the U.S. Navy fleet. Developed an in situ optical forecast model so the fleet will be able to deploy remote drifters, combine drifter data with meteorological and oceanographic data within the model, and predict optical properties along a coastline of interest. The models have been developed and validated with field measurements in Santa Cruz, California, and Waimanalo, Hawaii. Physical and optical characterization can be conducted on multiple temporal and spatial scales spanning a wide, dynamic range of conditions with the system.

Hydrodynamic Analysis of the Lower Fox River, Green Bay, Wisconsin — Managed a study to develop an extensively validated hydrodynamic model of Reach 3 and 4 of the Lower Fox River to support cap design in the river. Detailed velocity profile measurements were used to validate shear stresses so that a cap stability analysis could be conducted under design flow conditions. The U.S. Geological Survey (USGS) conducted all data collection efforts and provided more than 100 total velocity profiles over four sampling events. The data, combined with continuous velocity measurements at the mouth of the Fox River by a USGS acoustic velocity meter, allowed for the development and refinement of a hydrodynamic model of Reaches 3 and 4. The model was shown to reproduce measured velocities and shear stress to allow for confident cap design evaluations.

Mare Island Naval Shipyard Stability Analysis, Mare Island, California — Managed a project to better characterize the stability and potential for future exposure of munitions of environmental concern (MEC) and potential unexploded ordnance in the sediment offshore of Mare Island Naval Shipyard. Sediment cores were collected and analyzed to evaluate sedimentation and sediment stability through the radioisotope and SEDflume analysis. Based on the long-term morphological change of the

mudflats, it is possible for MEC to be exposed but there is no probability of MEC mobilizing. The results were carried forward into an engineering feasibility study of shoreline restoration.

EXPERT TESTIMONY

Contaminant Fate and Transport Assessment, Confidential Site — Subject matter expert on sediment and contaminant transport modeling for Superfund site allocation. Led efforts in modeling sediment and contaminant transport, reporting, and presentation of results to allocation mediators.

Contaminant Runoff and Dilution, Confidential Site — In support of litigation expert, evaluated contaminant runoff using Revised Universal Soil Loss Equation methods and estimated in-stream dilution, downstream transport, and floodplain deposition.

Expert Report, Direct Testimony, Cross Examination, and Rebuttal Testimony on behalf of Appleton Papers Inc. and NCR Corp. v. United States (Case No. 10-c-910) —
Participated as an expert on behalf of the defendants, in an action brought against Appleton Papers and NCR by the United States. Provided an expert report and testimony to demonstrate that the defendants were not liable for the entire harm to the Lower Fox River due to the discharge of PCBs. Developed a numerical model of hydrodynamics, sediment transport, and PCB transport to show that PCBs discharged from multiple parties on the river could be apportioned by discharger. Provided testimony and rebuttal testimony in the 2013 trial in the U.S. District Court Eastern District of Wisconsin.

Expert Report and Testimony to the San Francisco Public Utilities Commission on behalf of the Surfrider Foundation (Application A.12-04-19) —
In review of an application for a water supply project, provided an expert report and testimony on behalf of local stakeholders. The testimony reviewed the proposed brine discharge system for California American Water's Monterey Peninsula Water Supply Project. It also discussed brine mixing and dilution in marine environments. It finally discussed the modeling that will be necessary to accurately analyze the project's brine discharge and the design of appropriate facilities for that discharge.

Expert Testimony and Deposition on behalf of HoltraChem Manufacturing Company, L.L.C., in Natural Resources Defense Counsel and Maine People's Alliance v. HoltraChem Manufacturing Company, L.L.C. (Case No. 00-69-BW), United States District Court of Maine —
Provided an expert report and testimony assessing proposed sediment remedies for the Lower Penobscot River. Developed a numerical model and quantitative assessment of hydrodynamics and sediment transport to evaluate remedial actions in the river. Provided deposition in August 2019 in the United States District Court of Maine.

Expert Testimony on behalf of Monsanto Company, in Monsanto Company v. Spirer et al. (Case No. 12SL-CC01263), Circuit Court of the City of St. Louis, State of Missouri —
Provided testimony on the release, transport, and fate of PCBs in the global environment. The expert work included review of publicly available peer-reviewed research into the releases and transport of PCBs in the environment. The testimony detailed the routes of release and transport for PCBs from global manufacturing over the time period of global PCB production and use. Provided deposition in August 2016 in the Circuit Court of the City of St. Louis, State of Missouri.

Expert Testimony on behalf of Monsanto Company, in Monsanto Company v. Steele et al. (Case No. BC 497582), Superior Court of the State of California for the County of Los Angeles —
Provided testimony on the release, transport, and fate of PCBs in the global environment. The expert work included review of publicly available peer-reviewed research into the releases and transport of PCBs in the environment. The testimony detailed the routes of release and transport for PCBs from

global manufacturing over the time period of global PCB production and use. Provided deposition in April 2016 in the Superior Court of the State of California for the County of Los Angeles.

Expert Testimony on behalf of Monsanto Company, in Monsanto Company v. Walker et al. (Case No. 1122-CC09621-01), Circuit Court of the City of St. Louis, State of Missouri —
Provided testimony on the release, transport, and fate of PCBs in the global environment. The expert work included review of publicly available peer-reviewed research into the releases and transport of PCBs in the environment. The testimony detailed the routes of release and transport for PCBs from global manufacturing over the time period of global PCB production and use. Provided deposition in April 2016 and trial testimony in May 2016 in the 22nd Judicial Court District of St. Louis.

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Presentations / Posters

Jones, C., S. McWilliams, K. Raghukumar, G. Chang, and J. Roberts. 2020. Optimization of wave energy converter array deployments while minimizing potential environmental risks. Platform presentation at the 2020 Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Chang, G., F. Spada, C. Jones, G. Egan, S. Monismith, O. Fringer, and A. Manning. 2020. Variability of particle characteristics in a wave- and current-driven estuarine environment. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Sackmann, B., G. Revelas, K. Whitehead, C. Schultz, and C. Jones. 2020. Artificial intelligence and computer vision for cost-effective benthic habitat characterizations. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Spada, F., K. Raghukumar, G. Chang, and C. Jones. 2020. NoiseSpotter: Real-time underwater acoustic characterization in support of marine renewable energy projects. Poster presentation at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Egan, G., M. Cowherd, F. Spada, K. Scheu, A. J. Manning, C. Jones, G. Chang, and O.B. Fringer. 2020. Cohesive sediment erosion in a shallow, wave- and current-driven flow. Poster presentation at the 2020 Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, San Diego, CA. February 16–21.

Jones, C., K. Raghukumar, and L. Marx. 2019. Assessment of natural hazard vulnerability and resilience in coastal environments. Poster presentation at SERDP ESTCP Symposium, Washington, DC. December 3–5.

Raghukumar, K., C. Jones, J. Weidenbach, S. Kleinhelder, K. Catlett, and P. Black. 2019. An offshore munitions mobility study at Vandenberg Air Force Base, California. Poster presentation at SERDP ESTCP Symposium, Washington, DC. December 3–5.

Raghukumar, K., F.W. Spada, G. Chang, and C. Jones. 2019. Characterization of near-bed particle motion by the NoiseSpotter: A three-dimensional vector sensor array. Poster presentation at Fifth International Conference on the Effects of Noise on Aquatic Life. Den Haag, The Netherlands. July 7–12.

McWilliams, S., K. Scheu, C. Jones, and D. Revell. 2019. Matilija Dam ecosystem restoration—A comprehensive modeling approach. Poster presentation at Localizing California Waters: Ventura to SLO, Ojai, CA. April 29–30.

Raghukumar, K., G. Chang, F. Spada, and C. Jones. 2019. NoiseSpotter: New technology for underwater acoustic characterization. Poster presentation at 7th Annual Marine Energy Technology Symposium, Washington, DC. April 1–3.

Raghukumar, K., S. McWilliams, C. Jones, and J. Roberts. 2019. Marine hydrokinetic energy assessment: Balancing efficiency and environmental concerns. Poster presentation at 7th Annual Marine Energy Technology Symposium, Washington, DC. April 1–3.

Revelas, E., B. Sackmann, and C. Jones. 2019. A streamlined and standardized benthic habitat mapping approach for marine and hydrokinetic site environmental assessments. Poster presentation at 7th Annual Marine Energy Technology Symposium, Washington, DC. April 1–3.

Scheu, K., C. Flanary, K. Raghukumar, C. Jones, L. Ziliani, B. Groppelli, S. Ceccon, and D. Bocchiola. 2019. Evaluating climate change effects on natural recovery of a contaminated sediment site. Platform presentation at Tenth International Conference on the Remediation and Management of Contaminated Sediments, New Orleans, LA. February 11–14.

Sackmann, B.S., E. Revelas, K. Whitehead, D. Nielsen, C. Jones, and J. Durda. 2019. Using artificial intelligence and computer vision for cost-effective environmental monitoring and site characterization. Poster presentation at Tenth International Conference on the Remediation and Management of Contaminated Sediments, New Orleans, LA. February 11–14.

Egan, G., M. Cowherd, F. Spada, K. Scheu, A. Manning, C. Jones, S. Monismith, G. Chang, and O. Fringer. 2018. In situ observations of near-bed turbulence and cohesive sediment transport. Oral presentation at the American Geophysical Union Fall Meeting, Washington, DC. December 10–14.

Chang, G., F. Spada, G. Egan, A. Manning, K. Scheu, M. Cowherd, S. Monismith, C. Jones, and O. Fringer. 2018. Optics and acoustics for near-bed particle characterization and quantification of turbulence. Poster presentation at the Ocean Optics Conference (OOXIV), Dubrovnik, Croatia. October 7–12.

Scheu, K., C. Flanary, K. Raghukumar, and C. Jones. 2018. Evaluation of climate change effects on natural recovery in an alpine lake. Platform presentation. SETAC North America 39th Annual Meeting, Sacramento, CA. November 4–8.

Raghukumar, K., F. Spada, G. Chang, and C. Jones. 2018. Initial field trials of the NoiseSpotter: An acoustic monitoring and localization system. Oral presentation at the 6th Annual Marine Energy

Technology Symposium, Washington, DC. April 30–May 2.

Sackmann, B., E. Revelas, and C. Jones. 2018. Standardized and cost-effective benthic habitat mapping tools for marine and hydrokinetic site environmental assessments. Poster presented at 6th Annual Marine Energy Technology Symposium, Washington, DC. April 30–May 2.

Raghukumar, K., G. Chang, and C. Jones. 2018. Improved sea state characterization in support of marine renewable energy projects. Poster presented at 6th Annual Marine Energy Technology Symposium, Washington, DC. April 30–May 2.

Raghukumar, K., F. Spada, G. Chang, and C. Jones. 2018. Spatial characterization of surface waves using an array of newly developed wave buoys. Poster presented at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, Portland, OR. February 11–16.

Jones, C., and D. Revell. 2018. Coastal lagoon dynamics: An observational assessment of the San Lorenzo River mouth during natural and anthropogenic breaching. Poster presented at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, Portland, OR. February 11–16.

Chang, G., C. Jones, and J. Roberts. 2018. A techno-economic analysis of wave energy conversion for the United States Pacific coast. Poster presented at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, Portland, OR. February 11–16.

Spada, F., G. Chang, C. Jones, K. Raghukumar, P. Barney, W. Gans, T. Janssen, and Z. Kirshner. 2018. A motion-controlled wave buoy test stand for high fidelity data validation. Poster presented at the Ocean Sciences Meeting. Co-sponsored by the American Geophysical Union, the Association for the Sciences of Limnology and Oceanography, and The Oceanography Society, Portland, OR. February 11–16.

Flanary, C., G. Chang, C. Jones, F. Spada, and T. Martin. 2017. Innovative optically-based tools and techniques for water quality monitoring. Indian River Lagoon Research Institute, Technical Conference on Coastal Water Quality Issues, Melbourne, FL. September.

Martin, T., C. Jones, and G. Revelas. 2017. A novel approach to performance monitoring at sediment megasites. Sediment Management Work Group Fall Sponsor Forum, Charleston, SC. September 27–28.

Martin, T., G. Chang, C. Jones, and J. Durda. 2017. Use of high-frequency optically-based measurements to assess mercury cycling, transport, and fate in contaminated estuarine and riverine systems. Platform presentation. 13th International Conference on Mercury as a Global Pollutant, Providence, RI. July 16–21.

Jones, C., G. Chang, K. Nelson, and T. Martin. 2015. Field and modeling characterization of wetland hydrodynamics. Eighth International Conference on Remediation of Contaminated Sediments, New Orleans, LA.

Chang, G., C. Jones, and T. Martin. 2015. Near-bed sediment dynamics in the Berry's Creek tidal estuary. Eighth International Conference on Remediation of Contaminated Sediments, New Orleans, LA.

Thompson, R., K. Gustavson, C. Jones, and P. White. 2015. Investigating DDT fate and transport at the United Heckathorn Superfund site. Eighth International Conference on Remediation of Contaminated Sediments, New Orleans, LA.

Martin, T., P. de Haven, C. Jones, D. Glaser, and N. Kelsall. 2015. Evaluation of natural recovery in the Berry's Creek Study Area. Eighth International Conference on Remediation of Contaminated Sediments, New Orleans, LA.

Invited Participant, Expert Panels, and Workshops

Technical Chair of 2024 Offshore Technology Conference dedicated Offshore Wind Technical Thread.

Short course titled "Evaluating Sediment Transport: Best Practices, Tools, Techniques, and Application to Site Management." Eleventh International Conference on Remediation of Contaminated Sediments. Austin, TX. January 2023.

Short course titled "Evaluating Sediment Transport: Best Practices, Tools, Techniques, and Application to Site Management." Tenth International Conference on Remediation of Contaminated Sediments. January 2019.

Panel titled "Marine Renewable Energy Development – Oceanographic Measurements to Support an Emerging Low-Carbon Energy Source." Ocean Sciences Meeting 2018 Town Hall. February 2018.

Invited Moderator. Ocean Waves Workshop 2017. November 2017.

Short course titled "Evaluating Sediment Transport: Tools, Techniques, and Application to Site Management." Ninth International Conference on Remediation of Contaminated Sediments. January 2017.

Paper presentation titled "Evaluating Sediment Stability at Offshore Marine Hydrokinetic Energy Facilities." Ocean Waves Workshop 2015. January 2015.

Short course titled "Evaluating Sediment Transport: Tools, Techniques, and Application to Site Management." Eighth International Conference on Remediation of Contaminated Sediments. January 2015.